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SINUSITIS

Mohammad Maaz*[1]

*[1]Family Medicine, Symbiosis college, India.

ABSTRACT

Sinusitis is an inflammation of the sinus mucosa, the tissue lining the paranasal sinuses—air-filled cavities located in the forehead, cheeks, and nasal region. This condition commonly leads to symptoms such as facial pain, nasal congestion or rhinorrhea, and occasionally fever, along with other associated symptoms. Sinusitis is most frequently triggered by viral upper respiratory infections, like the common cold, but can also result from bacterial, fungal, or allergic causes.

I. INTRODUCTION

Sinusitis frequently occurs in individuals with predisposing factors like allergies, structural nasal issues, or congenital immune deficiencies. Viral infections are the leading cause of sinusitis. Those with asthma, cystic fibrosis, or weakened immune systems are more prone to recurrent sinusitis. Initial diagnosis is typically performed by an ENT specialist through nasal endoscopy, with imaging techniques such as CT scans reserved for chronic cases or suspected complications.

Prevention strategies include regular handwashing, vaccination, and avoiding exposure to tobacco smoke. Symptom management may involve analgesics like naproxen, nasal corticosteroids, and saline irrigation. For acute sinusitis, a watch-and-wait approach is recommended initially. If symptoms persist beyond 10–12 days or worsen, antibiotic treatment with amoxicillin or amoxicillin-clavulanate may be considered; although amoxicillin-clavulanate can be more effective, it may also increase the risk of side effects. In chronic cases or when medical treatment is ineffective, surgery may be an option.

Sinusitis is common, affecting about 15–35% of the population annually in the U.S. and Europe, while chronic sinusitis affects roughly 13.5%. The U.S. spends over $12 billion each year on sinusitis treatment, with a notable portion linked to the unnecessary use of antibiotics for viral cases.

II. EPIDEMIOLOGY

Sinusitis is a common condition, with an estimated 25 to 30 million cases occurring annually in the United States. Approximately 13.5% of people are affected by chronic sinusitis.

III. ETIOLOGY

Acute sinusitis typically follows an upper respiratory tract infection, usually viral in origin. The primary viral causes include rhinoviruses (with types RVA and RVC often leading to more severe infections compared to RVB), coronaviruses, and influenza viruses. Other implicated viruses include adenoviruses, human parainfluenza viruses, human respiratory syncytial virus, non-rhinovirus enteroviruses, and metapneumovirus. In cases of bacterial etiology, the three most common pathogens are *Streptococcus pneumoniae* (37%), *Haemophilus influenzae* (37%), and *Moraxella catarrhalis* (15%). Historically, *H. influenzae* was the predominant bacterial pathogen, but the introduction of the *Haemophilus influenzae* type B (Hib) vaccine has significantly reduced its incidence. Non-typable *H. influenzae* (NTHi) is now more frequently encountered in clinical settings. Additional bacterial pathogens associated with sinusitis include *Staphylococcus aureus*, other streptococcal species, anaerobes, and, less commonly, Gram-negative organisms. Viral sinusitis generally resolves within 8 to 12days.

Acute fungal sinusitis can occur, especially in immunocompromised individuals, such as those with diabetes or conditions like AIDS or in transplant patients on immunosuppressive therapy. These infections can be life-threatening, and in type I diabetes, diabetic ketoacidosis may predispose individuals to sinusitis caused by mucormycosis.

Chronic sinusitis, or chronic rhinosinusitis (CRS), is defined as persistent inflammation of the sinuses lasting longer than 13 weeks. This condition encompasses a range of disorders characterized by sustained sinus inflammation and is divided into subtypes based on the presence or absence of nasal polyps. When polyps are present, the condition is referred to as chronic hyperplastic rhinosinusitis. Although the precise etiology is not

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fully understood, structural anomalies, such as nasal septal deviation or concha bullosa (air-filled middle turbinate), can hinder mucosal drainage and contribute to the disease. Other contributing factors include allergic rhinitis, asthma, cystic fibrosis, and dental infections.

Rather than merely being an ongoing bacterial infection, CRS is increasingly recognized as an inflammatory condition. Thus, medical management emphasizes inflammation control to prevent obstruction and minimize recurrent infections. Surgical intervention is considered when medical therapy fails to alleviate symptoms.

In recent years, efforts have been made to refine the nomenclature for CRS subtypes. Eosinophilic mucin rhinosinusitis (EMRS) has been identified in many cases, with eosinophilic infiltration of the mucosa observed in affected individuals. EMRS is further divided into allergic and nonallergic types based on the presence or absence of a documented allergic response.

The role of fungi in CRS remains controversial; though suspected to contribute to the disease in some cases, the distinction between affected and unaffected individuals is unclear, and antifungal treatments have yielded inconsistent outcomes.

Emerging theories suggest that sinusitis may represent part of a broader spectrum of respiratory tract disorders, often referred to as the “one airway” hypothesis, which links CRS with asthma. Environmental factors, such as smoking and exposure to secondhand smoke, have also been associated with CRS, as have systemic conditions like cystic fibrosis and granulomatosis with polyangiitis.

IV. PATHOPHYSIOLOGY

Biofilm-associated bacterial infections are implicated in numerous cases of chronic sinusitis that do not respond to antibiotic therapy. Biofilms are structured communities composed of an extracellular matrix and multiple interdependent microbial species, many of which are challenging or even unidentifiable through conventional clinical laboratory methods. Bacteria within biofilms can exhibit up to a 1000-fold increase in antibiotic resistance compared to their planktonic (free-living) counterparts. Recent studies have demonstrated biofilm presence on the mucosal surfaces of 75% of patients undergoing surgical intervention for chronic sinusitis.

V. TREATMENT

Sinusitis, or inflammation of the sinus lining, can be caused by infections, allergies, or other factors. Treatment options depend on whether it's acute (short-term) or chronic (long-lasting). Here are common treatments:

1. **Acute Sinusitis Treatment**

- **Rest and Hydration**: Adequate rest and fluid intake help the body recover.

- **Pain Relievers**: Over-the-counter pain relievers like ibuprofen or acetaminophen can help reduce pain and fever.

- **Decongestants**: Oral or nasal decongestants can relieve nasal congestion. However, nasal decongestant sprays should not be used for more than three days to avoid rebound congestion.

- **Nasal Saline Irrigation**: Using a saline spray or neti pot can help clear mucus and allergens from the nasal passages.

- **Antibiotics**: These may be prescribed if a bacterial infection is suspected, but they are not effective for viral infections.

2. **Chronic Sinusitis Treatment**

- **Nasal Corticosteroids**: Prescription sprays can reduce inflammation.

- **Saline Irrigation**: Regularly flushing the nasal passages with saline can help.

- **Allergy Treatments**: If allergies contribute to chronic sinusitis, antihistamines or allergy shots may be recommended.

- **Surgery**: In some cases, surgery to remove blockages or improve sinus drainage may be necessary.

VI. CONCLUSION

A 2018 review indicated that without antibiotics, approximately 47% of patients were cured after one week, and 65% after two weeks.

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